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O.S.R.D. No. 6135
Date Oct. 17, 1945

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OSRD List 31. 5-9 Aug 46 MG.

ROCKET FLARES

A Final Report - Contract OEM-sr-968

By

THE BUDD WHEEL COMPANY
ENGINEERING DEPARTMENT
ROCKET DIVISION

Submitted on: Nov. 14, 1945

By N R Droulard
N. R. Droulard

W. W. Farr

W B Pope.
W. B. Pope

Approved by:

11-14-45 C L Eksergian
C. L. Eksergian,
Chief Engineer,
Budd Wheel Co.

11-15-45 C. N. Hickman
C. N. Hickman,
Chief, Sec. H.

11-15-45 F. L. Hovde
F. L. Hovde,
Chief, Div. 3

20061030004

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PREFACE

The rockets described in this report are pertinent to the project designated by the War Department Liaison Officer as OD-170 and to the project designated by the Navy Department Liaison Officer as NO-252. Engineering of the metal components and production of test models were performed by the Budd Wheel Company. Most of the testing was done at the Jet Propulsion Research Laboratory, Indian Head, Maryland. This work was under the supervision of Section H, National Defense Research Committee. When the laboratory operations of Section H were transferred to Cumberland, Maryland, the testing was done by the Allegany Ballistics Laboratory. This laboratory was operated for Section H by The George Washington University under contract OEMsr-273. All of the testing work is described in the final report by the Allegany Ballistics Laboratory ("Rocket Flares", O.S.R.D. 5778). This project was referred to in their files as W-50.

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ABSTRACT

Three Rocket Flare models were engineered and manufactured for Section H, Division 3, of the National Defense Research Committee, by the Budd Wheel Company. These were known as the IF3-M1, IF3-M2, and IF3-M3 models. All were $3\frac{1}{4}$" diameter inductively heat-treated rocket motors. The heads were of two sizes and contained a black powder charge which at the proper time expelled the Navy parachute flare from the rocket.

INTRODUCTION

In the fall of 1942 the project of developing a rocket motor for propelling a Naval parachute flare was undertaken by Section H of Division A of the National Defense Research Committee. The purpose of this development was to provide a means of silhouetting a submarine or vessel on the water's surface. The Budd Wheel Co. was requested to design and construct the test models.

IF3-M1 Flare Rocket

The original conception of this rocket is illustrated in the Indian Head Jet Propulsion Research Laboratory Drawing 146 dated September 14, 1942, see page 11. The subsequent designs developed conformed fundamentally to this proposal. This drawing shows:

1. In the front of the rocket is a 2-1/2" outer diameter casing which contains a Navy parachute flare.

2. Propelling the flare is a 3¼" rocket with integral Venturi. For stability of flight, a folding fin assembly is attached to the end of the rocket.

3. The flare casing and the rocket chamber are joined together by means of a threaded adaptor.

4. In order to provide a time delay between the ignition of the rocket powder and the ignition of the flare expulsion charge, a powder train is incorporated between the rocket chamber and the flare container.

5. Electrical squib ignition is at the front of the rocket propulsion charge. Contacts are provided by a tapered plug similar to that used in the Army T-22 rocket.

6. The rocket chamber was specified by the National Defense Research Committee to be capable of withstanding 6000 p.s.i. internal pressure. 81 mm hot rolled trench mortar tubing was available and in order to meet the pressure specification, the rocket tube was heat-treated. The method of manufacture of this rocket chamber was similar to that of the T-5 and T-6 3-1/4" Ordnance Rockets, and the details are reported in Budd Wheel Company's Investigation #M-3, a final report on Ordnance Contract under date of January 21, 1944. The critical points of consideration in the production of these chambers, as well as any other heat-treated and machined rocket chambers, are:

a. Where the body wall is heat-treated before hot Venturi forming then the heat for forming the Venturi must not be allowed to extend into the full body diameter section; otherwise, a weakened annealed band occurs in the rocket body.

b. The body must be properly stress-relieved after cold working operations. In this rocket this operation was necessary after shrinking in the upset end of the tube.

c. The annealed band for the safety groove must be correctly positioned so that the subsequent machining of the safety groove is at the weakened section.

Indian Head Drawing 146 was submitted to the Budd Wheel Company for design proposal and study by Dr. C. N. Hickman shortly after its completion. At that time, Budd Wheel Company was being engaged by the Ordnance Department to develop their 3-1/4" T-5 and T-6 experimental rockets and it was thought that by engineering compromise a propulsion motor could be developed for all three rockets. With this in mind, in January of 1943 layouts were made by the Budd Wheel Company in an effort to combine the specifications for all three rocket chambers.

In the production of the T-5 and T-6 3-1/4" Ordnance rocket chambers, the design had, in order to keep weight to a minimum, incorporated a .093" chamber wall thickness. This was found impractical in production because of the excessive warpage that resulted from the heat treat process. Therefore, the Budd Wheel Company suggested to the National Defense Research Committee that a .125" rocket chamber wall thickness be allowed in their model. This was agreed upon and it became the basis of design for the ensuing 3-1/4" flare rocket chamber. The first 50 samples of this model rocket were produced according to Budd Wheel Drawing 47087 as shown on pages 14 and 15. Also, see Photographs 1 and 2 on pages 21 and 22. Drawing 47087 followed substantially the original design as outlined in the description of Indian Head Drawing 146. From an engineering viewpoint it was refined by the Budd Wheel Company, in that:

(1) The threaded end of the rocket chamber was upset to provide the same strength in the threaded joint as in the body itself.

(2) The powder was supported on an integral trap assembly supported from a machined ledge in the upset section instead of by the individual worm head wires as shown in the Indian Head Drawing.

(3) The flare and delay train were revised upon engineering consultation between Dr. A. Kossiakoff of the

National Defense Research Committee and the Naval Ordnance Plant of Baldwin, Long Island, New York. Details of the flare design are shown in Navy sketch 64426 on page 12.

(4) The safety groove was provided in the upset section of the rocket chamber instead of at the rear of the chamber as shown in the Indian Head Drawing.

After approval of the drawings approximately 300 samples were produced and delivered for tests in March through May of 1943. After the testing of this initial experimental production, a re-interest was shown in this project by the Services. Therefore, 826 additional assemblies were ordered and these were delivered from October 23, 1943 to March 6, 1944. Differences between this production and the prior production of these flare rockets were of a minor order and therefore are not embodied in this report.

IF3-M2 Flare Rockets

Twenty-five 3-1/4" rocket assemblies were produced in October 1942, conforming to Drawing 50196, page 18. It will be noted that this assembly is identical to the IF3-M1 model already described except that the flare case on the IF3-M2 is 3-1/4" outside diameter instead of 2-1/2". This provided room enough for a larger Navy flare with approximately twice the candlepower of the IF3-M1 model. Drawing 50061 is the sub-assembly of the casing and nose and is shown on page 17. See Photographs 3 and 4 on pages 23 and 24.

IF3-M3 Flare Rockets

This 3-1/4" rocket flare was identical to the IF3-M2 model except that no trap system was originally required. Consequently the chamber did not incorporate an upset shoulder for support of a trap plate. The chamber is illustrated on Drawing 51076, page 19. After the chambers were built, however, the Budd Wheel Company was requested to add a special powder trap. The special trap consisted of a three legged spider which was welded inside of the chamber at the Venturi end to support the single grain of cast powder, known as the "Alternate Propellent". Drawing 51086, page 20, shows the trap installation.

Sixty of these models were manufactured for experimental purposes and delivered in June 1944. Twenty were made with a 1" diameter Venturi throat, twenty with a 1.09" diameter throat, and twenty with a 1.18" diameter throat. Photograph 5, page 25, illustrates the completed assembly.

HYDROSTATIC TEST OF 3-1/4" FLARE ROCKETS

During the development and in the production of these rockets, hydrostatic tests were used to check the chamber strength. Test 428-A-B is included in this report and is representative of these tests. (see pages 7 through 10.) It will be observed in this test that the safety groove failed at 6,600 p.s.i. and that the body had not failed at 12,000 p.s.i. Other hydrostatic tests applying to these rockets are Budd Wheel Tests 337, 350, 359, 360, 361, 420, 429, 444, 445, 474, 484, 497, 498, 499, 516, 531, 540, 541, 567, 574, 575, 583, 608 and 620. These tests are available for reference in the Budd Wheel Company's Engineering files.

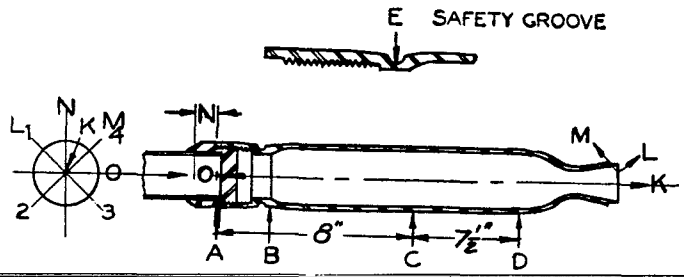
The rockets were subjected to firing tests at the Jet Propulsion Research Laboratory, Indian Head, Maryland. Results of these tests are covered in O.S.R.D. Report 5778, prepared by the Allegany Ballistics Laboratory.

APPENDIX

BUDD WHEEL COMPANY
ENGINEERING DEPT.

PHYSICAL TEST DIVISION
EXPERIMENTAL DEPT.

TEST NO.: 428-A.
RUN NO.:
DATE: 10-26-43.



PHYSICAL PROPERTIES

	HARDNESS "C" ROCKWELL	THICKNESS	HARDNESS DEPTH	TENSILE
A				
B				
C				
D				

EXPERIMENTAL: PRODUCTION: X.
TYPE OF TEST SAMPLE: 3-1/4" Assembly.
SAMPLE SUBMITTED BY: Elder DATE: 10-25-43.
PART NO.: 47037-D. (Assy. #F-562)
TYPE OF TEST: Internal hydraulic pressure.
PURPOSE OF TEST: Determine strength of production.

READINGS

PRESSURE (PSI)	A		B		C		D				K	L	M	N	O
1000	.0005	.0005			-.0005	.0015	-.0015	.0015							
2000	.0005	.0005			-.0005	.003	-.0025	.003							
3000	.0015	.0015			-.0005	.004	-.0035	.004							
4000	.0025	.002			.000	.0045	-.0035	.005							
5000	.0035	.0035			.0005	.005	-.004	.0055							
5500	.0045	.0045			.001	.0055	-.0045	.006							
6000	.005	.006			.001	.006	-.0055	.007							
6500	.006	.007			-.0005	.009	-.0085	.0105							
6600			Safety groove failed.												

ANALYSIS

C | Mn

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REMARKS:

Safety groove: .040"
Shake in thread: .015"
Thread overlap: .067" P- .0335"
Pilot clearance: .003"

Assembly was placed in test fixture and held in place by means of a split bushing engaging head. Hydraulic pressure was then applied through hole in plug welded in at venturi end of chamber.

Readings were taken as per above sketch.

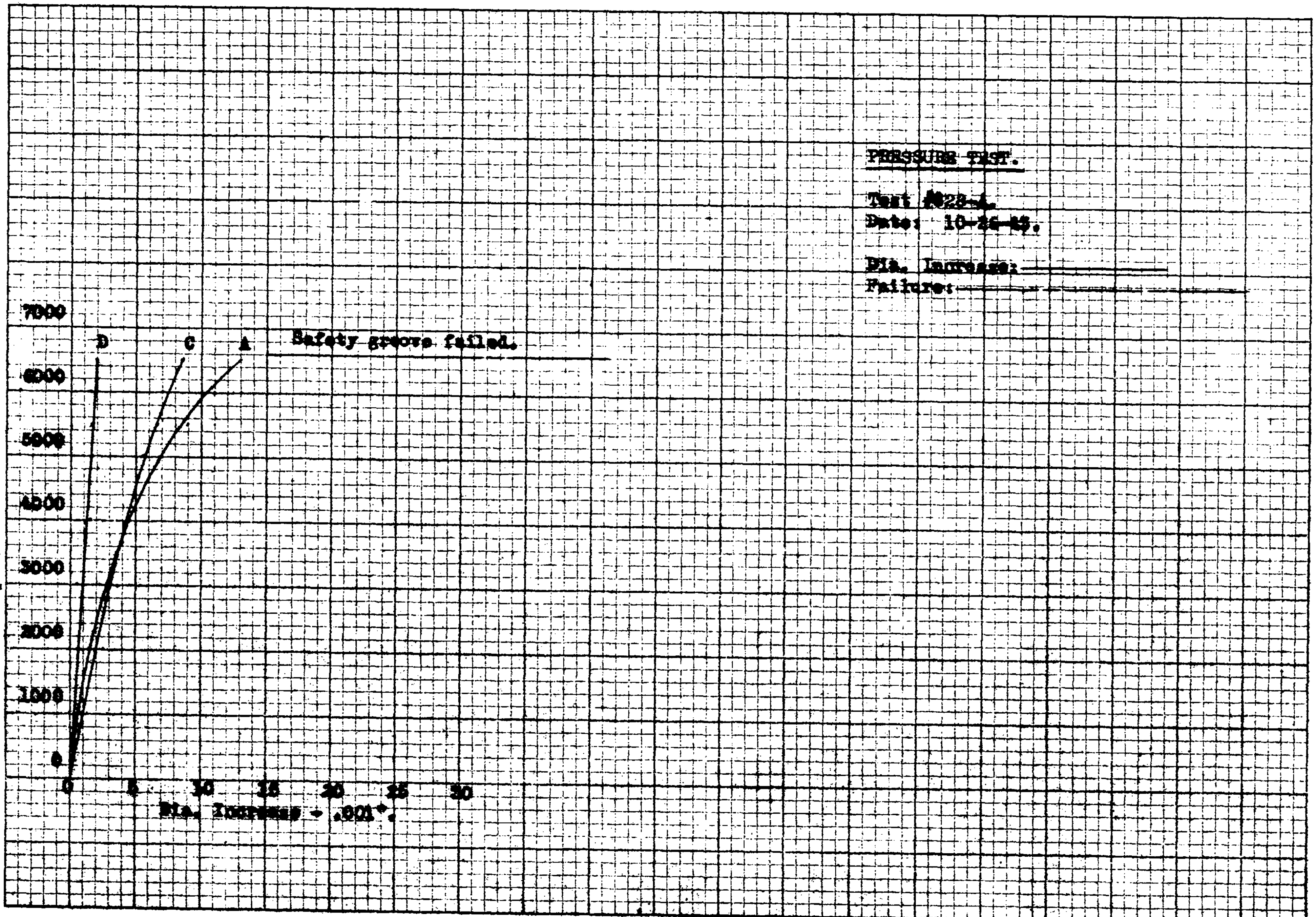
At 6600 psi safety groove failed.

Dia.	A	B	C	D
Before	3.250	3.252	3.251	3.251
After	.257	.260	.252	.252
Set	.007	.008	.001	.001

CONCLUSIONS: Chamber and safety groove O.K.

REFER TO TEST NOS.:
RUN BY: J. Aylsworth.
REPORTED BY: C. A. Temple.
CONDUCTED BY: W. J. Bortman.

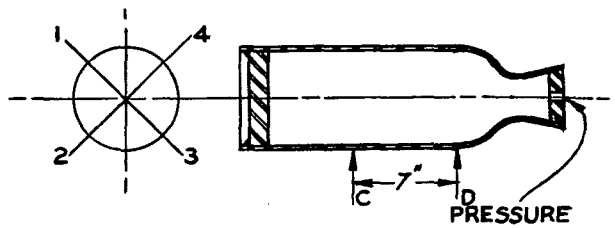
F. 6778 3M (COPY) 1-44


PRESSURE TEST.
Test
Date:
Dia. Increase:
Failure:
Safety groove failed.
D
C
A
7000
6000
5000
4000
3000
2000
1000
0
0
5
10
15
20
25
30
Dia. Increase - .001".
Pressure - psi.

BUDD WHEEL COMPANY
ENGINEERING DEPT.

PHYSICAL TEST DIVISION
EXPERIMENTAL DEPT.

TEST NO.: 428-B
RUN NO.:
DATE: 10-29-43



PHYSICAL PROPERTIES

	HARDNESS "C" ROCKWELL	THICKNESS	HARDNESS DEPTH	TENSILE
A				
B				
C				
D				

EXPERIMENTAL: PRODUCTION: X
TYPE OF TEST SAMPLE: 3¼" Chamber.
SAMPLE SUBMITTED BY: Elder DATE: 10-25-43
PART NO.: 47013-E (Assy. #F-562)
TYPE OF TEST: Internal hydraulic pressure.
PURPOSE OF TEST: Determine strength of production.

READINGS

PRESSURE (PSI)	A		B		C		D				K	L	M	N	O
1000	1	8			.000	.000	.000	.000							
2000					.0005	.0005	.000	.0005							
3000					.001	.001	.000	.001							
4000					.001	.002	.0005	.002							
5000					.0015	.0025	.0005	.003							
6000					.0015	.0035	.0005	.0035							
7000					.002	.004	.001	.004							
7500					.002	.005	.001	.0045							
8000					.0025	.0055	.0015	.005							
8500					.0025	.006	.0015	.0055							
9000					.0025	.0065	.0015	.006							
9500					.003	.007	.0015	.007							
12000					No failure.										

ANALYSIS

C	Mn					

REMARKS:

This chamber was previously used in Test #428-A. Safety groove failed at 6600 psi.

After chamber failed in Test #428-A a 4" section was cut off the threaded end. A solid plug was then welded into chamber, and chamber was placed in test fixture and held in place by means of a split bushing engaging chamber at the welded-in plug.

Hydraulic pressure was applied through venturi end of chamber and readings were taken of radial increase by means of dial indicators, as per above sketch.

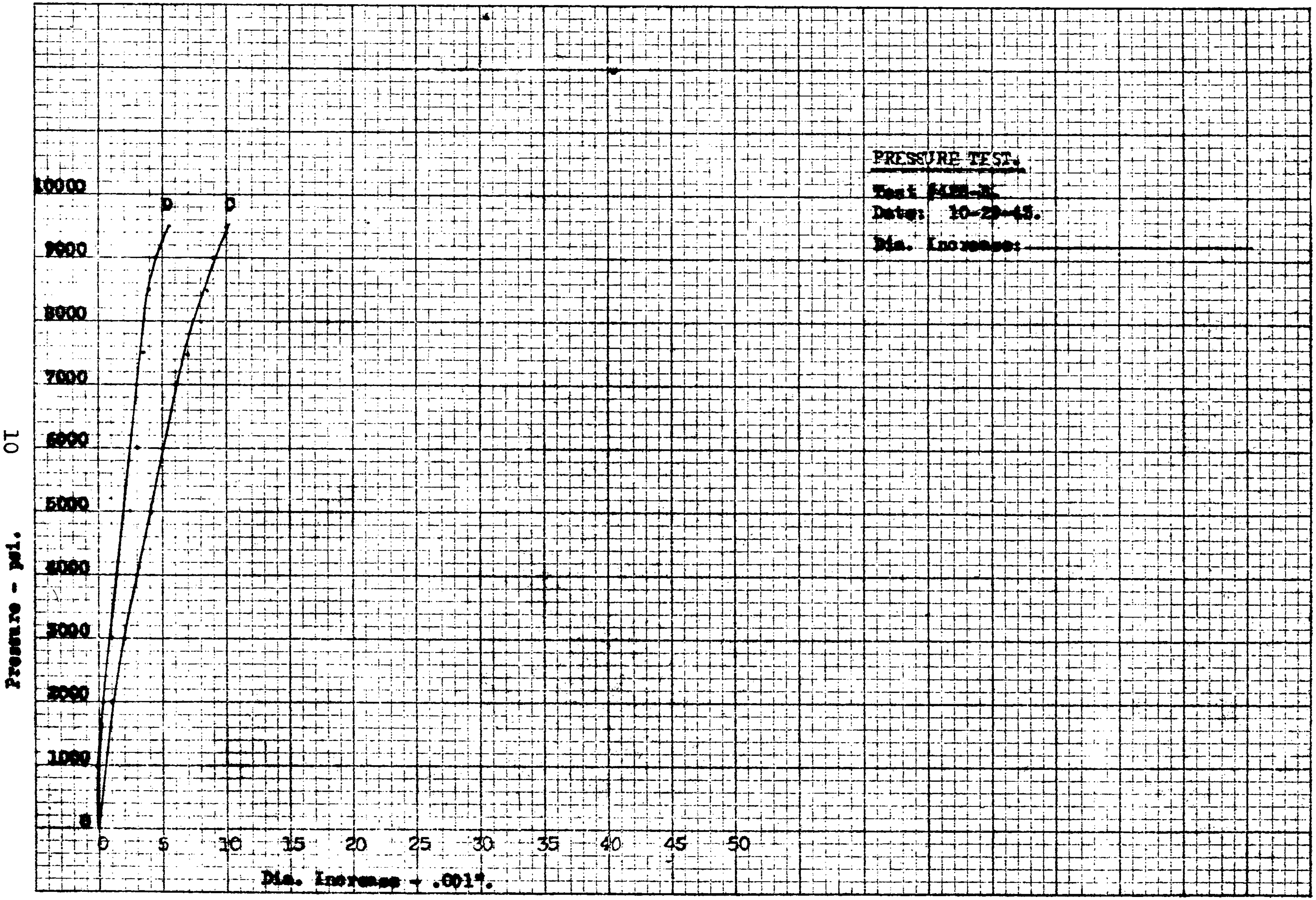
At 9500 psi the seal leaked slightly but hydraulic pump was worked until 12000 psi was reached. Test was then discontinued. No failure.

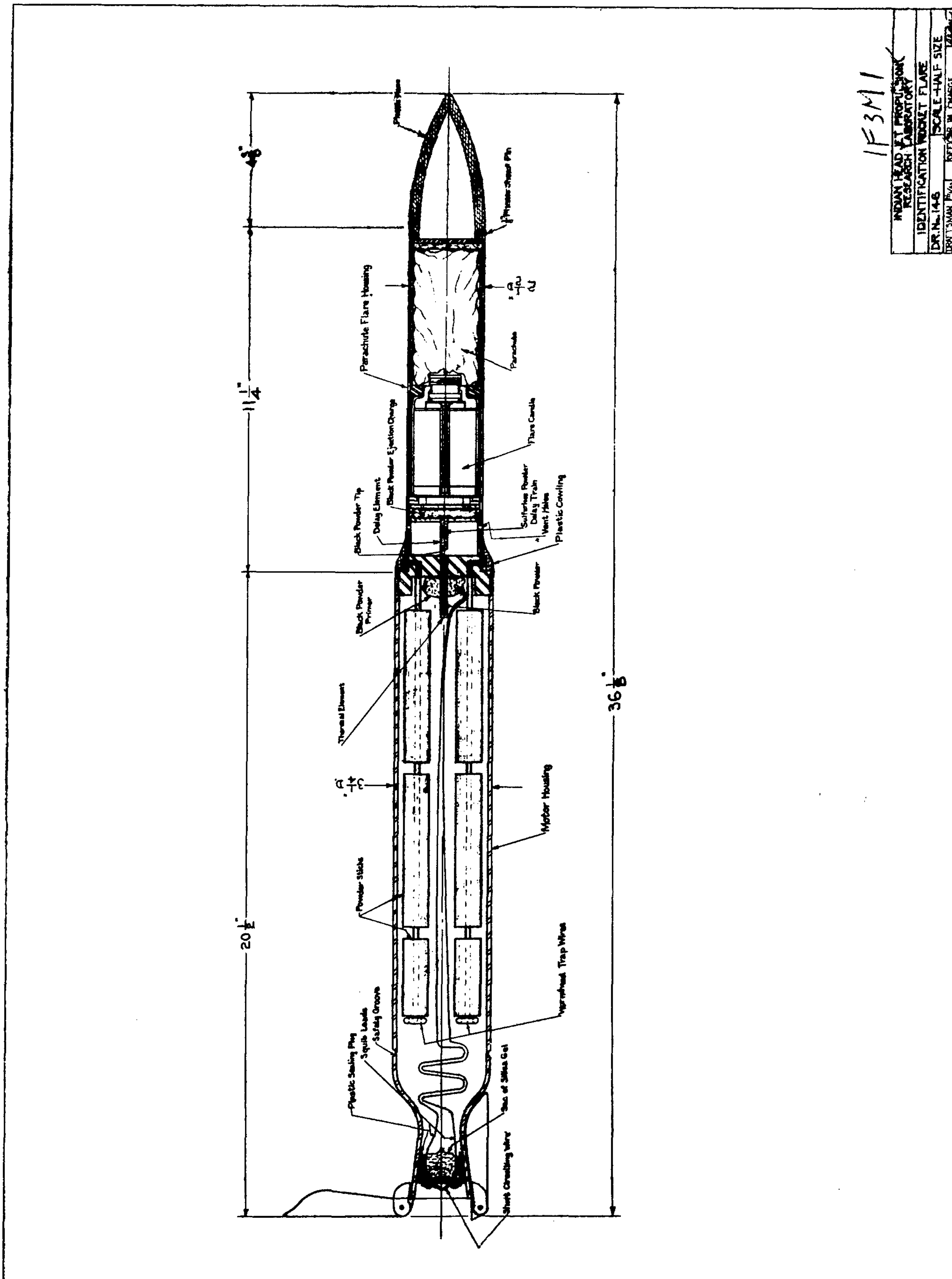
CONCLUSIONS:

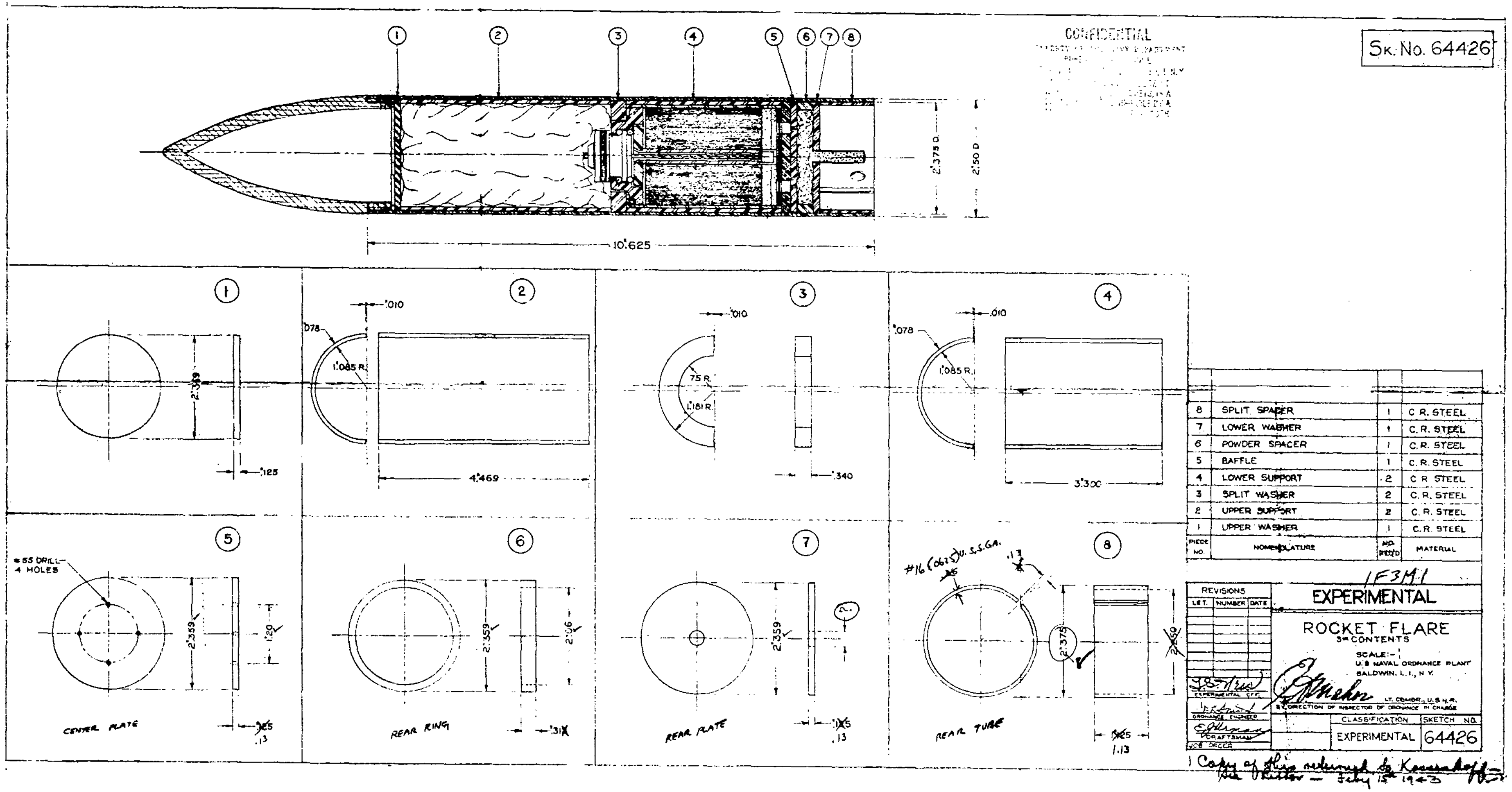
Chamber O.K.

REFER TO TEST NOS.:
RUN BY: J. Aylsworth
REPORTED BY: C. A. Temple
CONDUCTED BY: W. J. Portman

F. 6778 3M (COPY) 1-44


PRESSURE TEST.
Date: 10-29-45.
Dia. Increase:
Pressure - psi.
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
D
D
0
5
10
15
20
25
30
35
40
45
50
Dia. Increase + .001".


INDIAN HEAD JET PROPULSION RESEARCH LABORATORY
IDENTIFICATION ROCKET FLARE
SCALE-HALF SIZE
DR. No. 14-6
1F3M11
4 3/8"
11 1/4"
20 1/2"
36 1/8"
Parachute Flare Housing
Parachute
Flare Candle
Black Powder Ejection Charge
Delay Element
Black Powder Tip
Sulfurless Powder Delay Train
Vent Holes
Plastic Cowling
Black Powder Primer
Black Powder
Thermal Element
Motor Housing
Powder Sticks
Warhead Trap Wire
Safety Groove
Squib Leads
Plastic Sealing Plug
Bag of Silica Gel
Shunt Circuiting Wire


CONFIDENTIAL
Sk. No. 64426
10.625
2.375 D.
2.50 D.
CENTER PLATE
REAR RING
REAR PLATE
REAR TUBE
#55 DRILL-4 HOLES
8 SPLIT SPACER 1 C.R. STEEL
7 LOWER WASHER 1 C.R. STEEL
6 POWDER SPACER 1 C.R. STEEL
5 BAFFLE 1 C.R. STEEL
4 LOWER SUPPORT 2 C.R. STEEL
3 SPLIT WASHER 2 C.R. STEEL
2 UPPER SUPPORT 2 C.R. STEEL
1 UPPER WASHER 1 C.R. STEEL
PIECE NO. NOMENCLATURE NO. REQ'D MATERIAL
1F3M1
EXPERIMENTAL
ROCKET FLARE
3" CONTENTS
SCALE:- 1
U.S. NAVAL ORDNANCE PLANT
BALDWIN, L. I., N. Y.
LT. COMDR., U.S.N.R.
BY DIRECTION OF INSPECTOR OF ORDNANCE IN CHARGE
REVISIONS
CLASSIFICATION
SKETCH NO.
EXPERIMENTAL 64426
1 Copy of this returned to Kossiakoff — Feby 15th 1943

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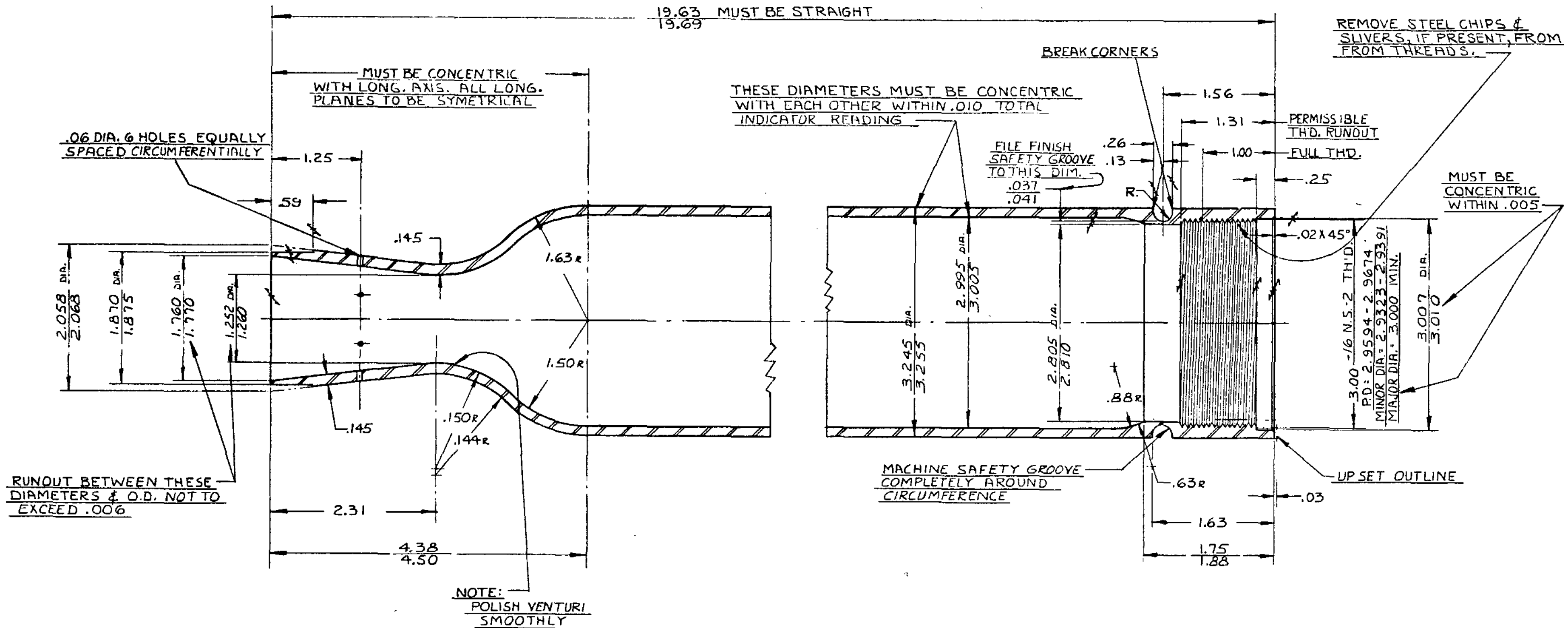
UNLESS OTHERWISE SPECIFIED.



MATERIAL:
SEAMLESS STEEL TUBING
S.A.E. #1035

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ACID PROOF BLACK PAINT

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CHKD. 3-11-44	
APPVD. 3-13-44	
MAT. APP.	SUP. (ORIG) / SUP. BY
SCALE:- FULL	BUDD WHEEL CO. DETROIT, MICHIGAN — 47013 D

REL	CK.	CHGE		DESCRIPTION	DATE
14248		25152	R	REDRAWN NO CHANGE	3-8-44 JES

47013 D

47087 D

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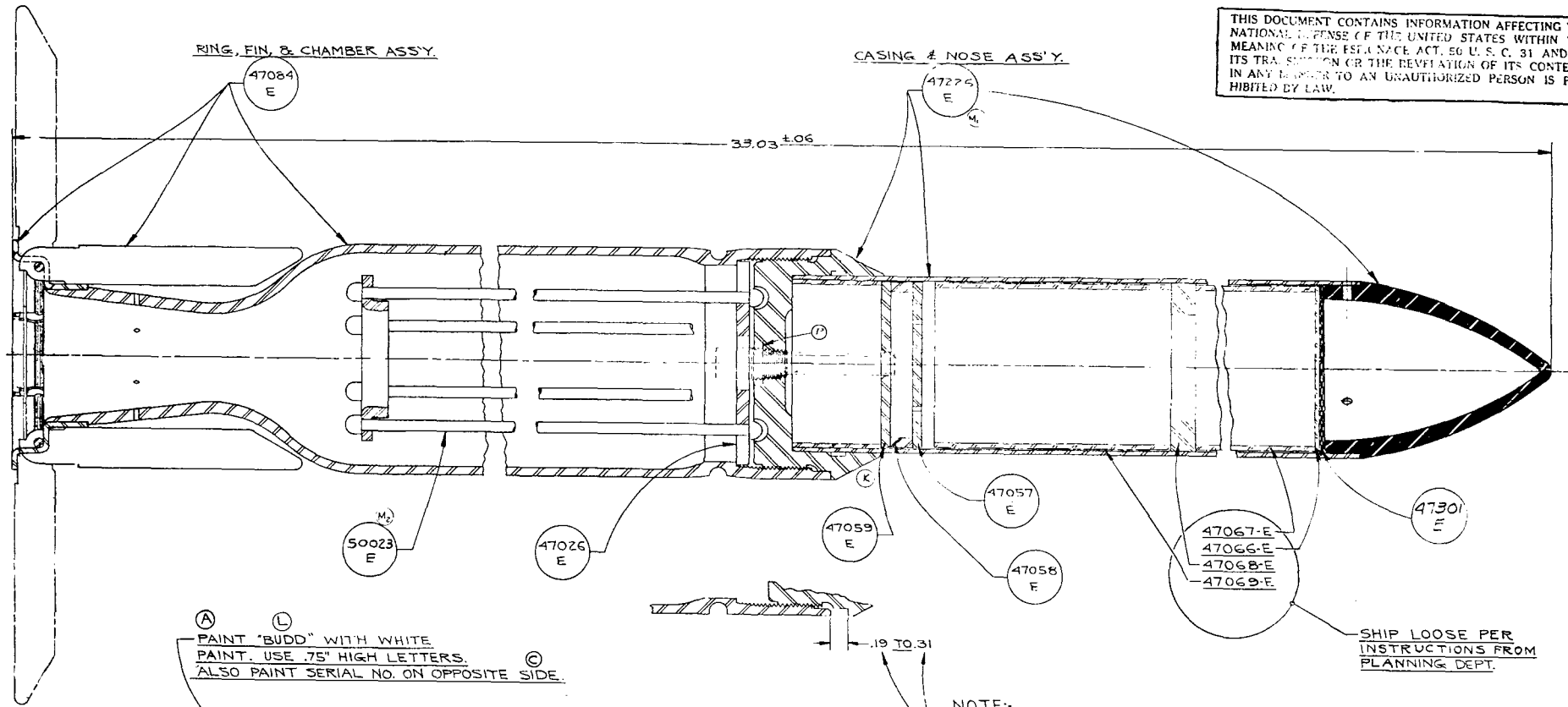

(A) (L) PAINT "BUDD" WITH WHITE PAINT. USE .75" HIGH LETTERS. (C) ALSO PAINT SERIAL NO. ON OPPOSITE SIDE.

STAMP "H" (HEAVY SIDE) HERE IN LINE WITH SERIAL NO. ON HEAD.

STAMP SERIAL NO. 2-PLACES AS SHOWN.

PAINT OUTSIDE SURFACES OF CHAMBER, HEAD, AND CASING WITH BLACK LACQUER ENAMEL.

RELICK.	CHGE		DESCRIPTION	DATE
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	23706	M	M1 - REVISED A PER DETAIL M2 - WAS 47038-E	9-15-43
	23702	L	WAS "BUDD EMPTY"	9-14-43
	23701	K	VENT HOLES REMOVED	9-7-43
	23533	J	WAS OBSOLETE-NOW REINSTATED	7-18-43
	23290	H	CHAMBER REVISED PER DETAIL	4-14-43
	23249	G	OVERALL LENGTH WAS 33.00	4-6-43
	23220	F	PART Nº 47301-E ADDED	3-31-43
~	~	E	CASING & NOSE ASSY. WAS 47086-E	3-10-43
~	~	D	NOSE ADDED	3-8-43
~	~	C	PAINTING OF SERIAL NO. ADDED,	2-22-43
~	~	B	HEAD REVISED PER DETAIL.	2-20-43
~	~	A	NOTE ADDED.	2-15-43

OBSOLETE DATE 3-8-44 BY Z.G CHANGE No. 25098

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CHKD.	(N) IF-3-M1
APPVD. 4-23-43	
MAT. APP.	SUP.
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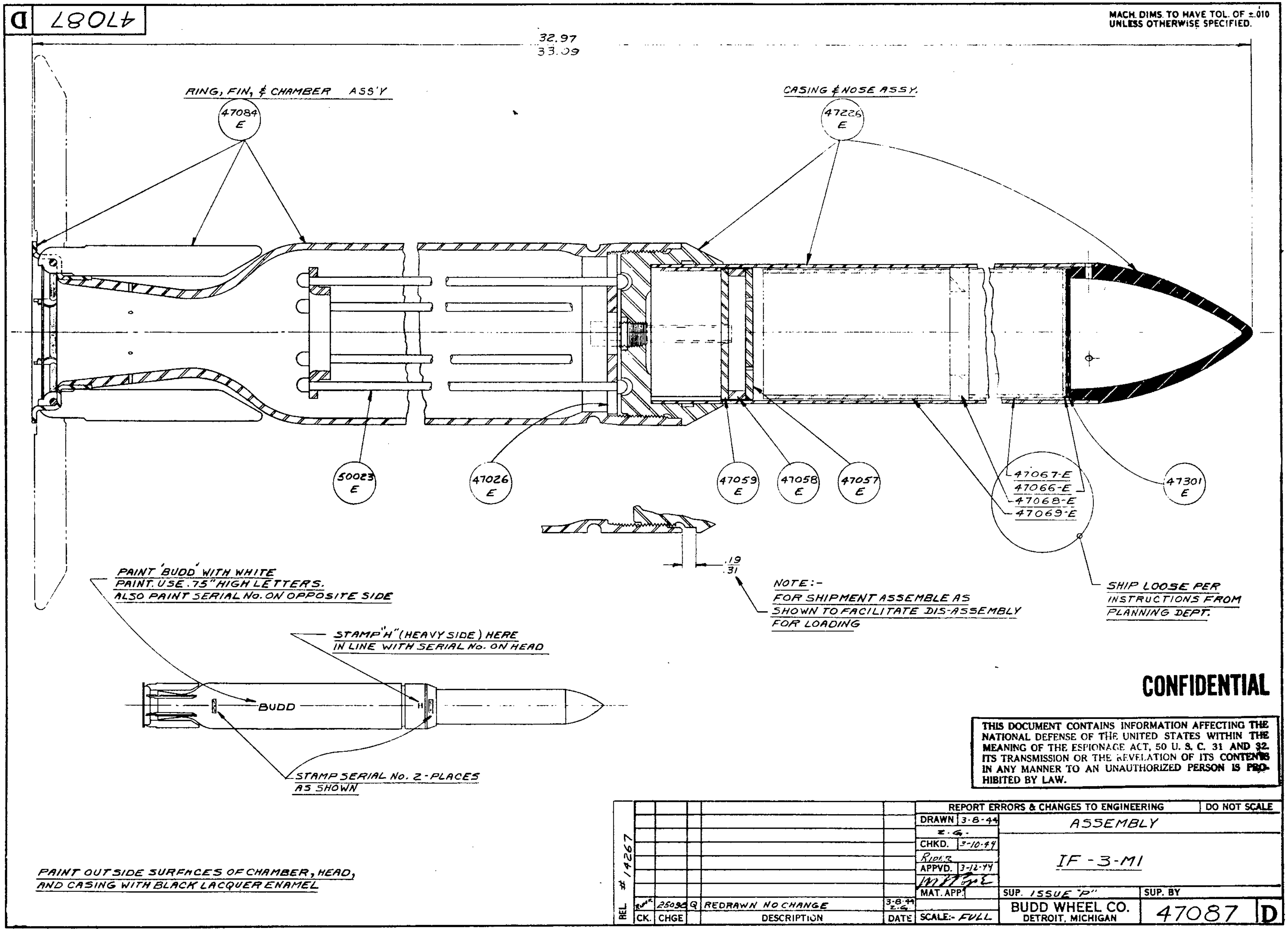
BUDD WHEEL CO. DETROIT, MICHIGAN

47087 D


D 47087
MACH. DIMS. TO HAVE TOL. OF ±.010 UNLESS OTHERWISE SPECIFIED.
32.97
33.09
RING, FIN, & CHAMBER ASS'Y
47084 E
CASING & NOSE ASSY.
47226 E
50023 E
47026 E
47059 E
47058 E
47057 E
47067-E
47066-E
47068-E
47069-E
47301 E
.19
.31
NOTE:-
FOR SHIPMENT ASSEMBLE AS SHOWN TO FACILITATE DIS-ASSEMBLY FOR LOADING
SHIP LOOSE PER INSTRUCTIONS FROM PLANNING DEPT.
PAINT 'BUDD' WITH WHITE PAINT. USE .75" HIGH LETTERS. ALSO PAINT SERIAL No. ON OPPOSITE SIDE
STAMP "H" (HEAVY SIDE) HERE IN LINE WITH SERIAL No. ON HEAD
BUDD
STAMP SERIAL No. 2-PLACES AS SHOWN
PAINT OUTSIDE SURFACES OF CHAMBER, HEAD, AND CASING WITH BLACK LACQUER ENAMEL
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DO NOT SCALE
DRAWN 3-8-44
CHKD. 3-10-44
APPVD. 3-12-44
MAT. APP.
ASSEMBLY
IF-3-M1
SUP. ISSUE "P"
SUP. BY
BUDD WHEEL CO.
DETROIT, MICHIGAN
47087 D
SCALE:- FULL
REL # 14267
25098 Q REDRAWN NO CHANGE 3-8-44
CK. CHGE DESCRIPTION DATE

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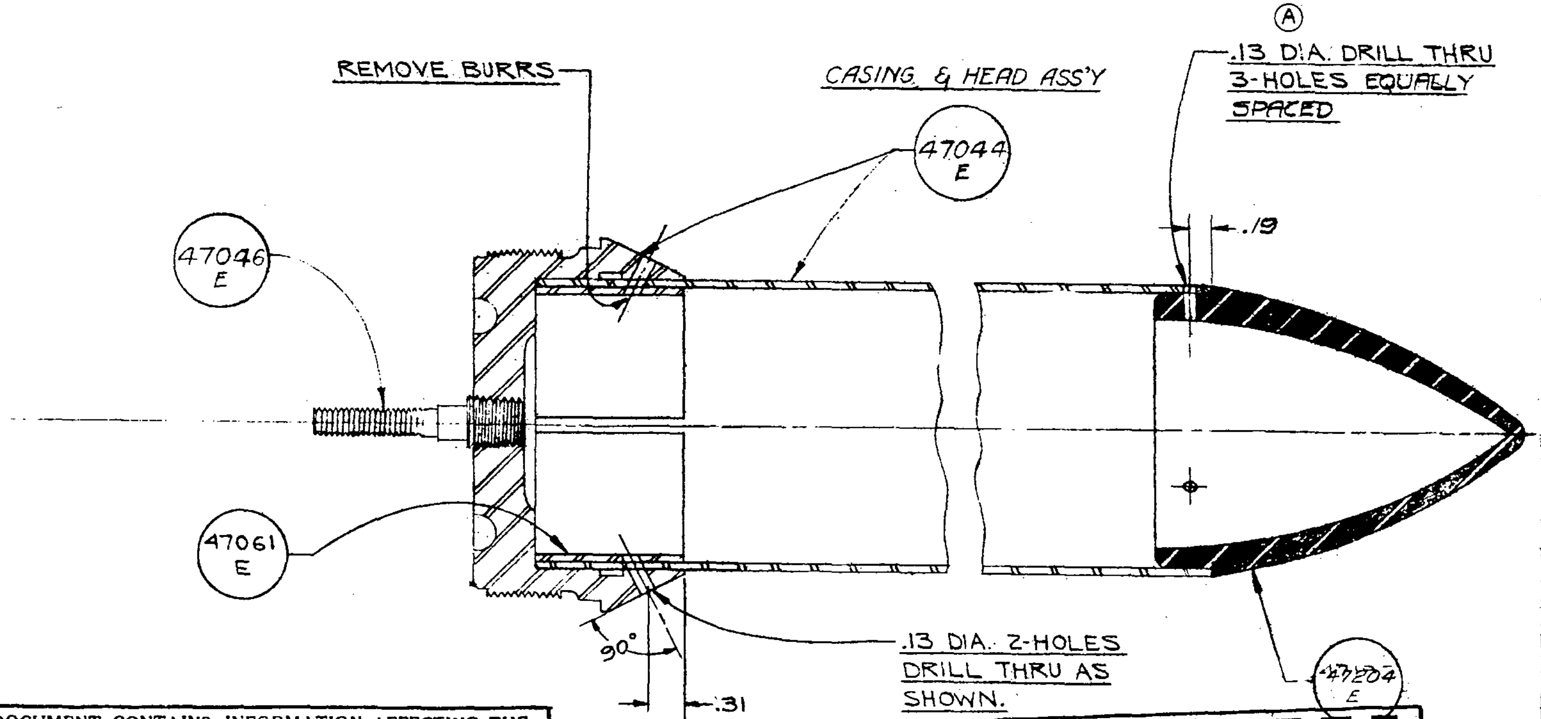

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BY F. KLAGER DATE 4-7-43
CHANGE No. 23250

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	23175	A	DRILLING NOTE REVISED	3-25-43

REL-14279

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DRAWN 3-10-43 BONAR
CHKD. 3-12-43
APPVD.
MAT. APP.
SCALE:- FULL

CASING & NOSE ASS'Y
3¼ NC. MODEL
AFTER 1ST 137

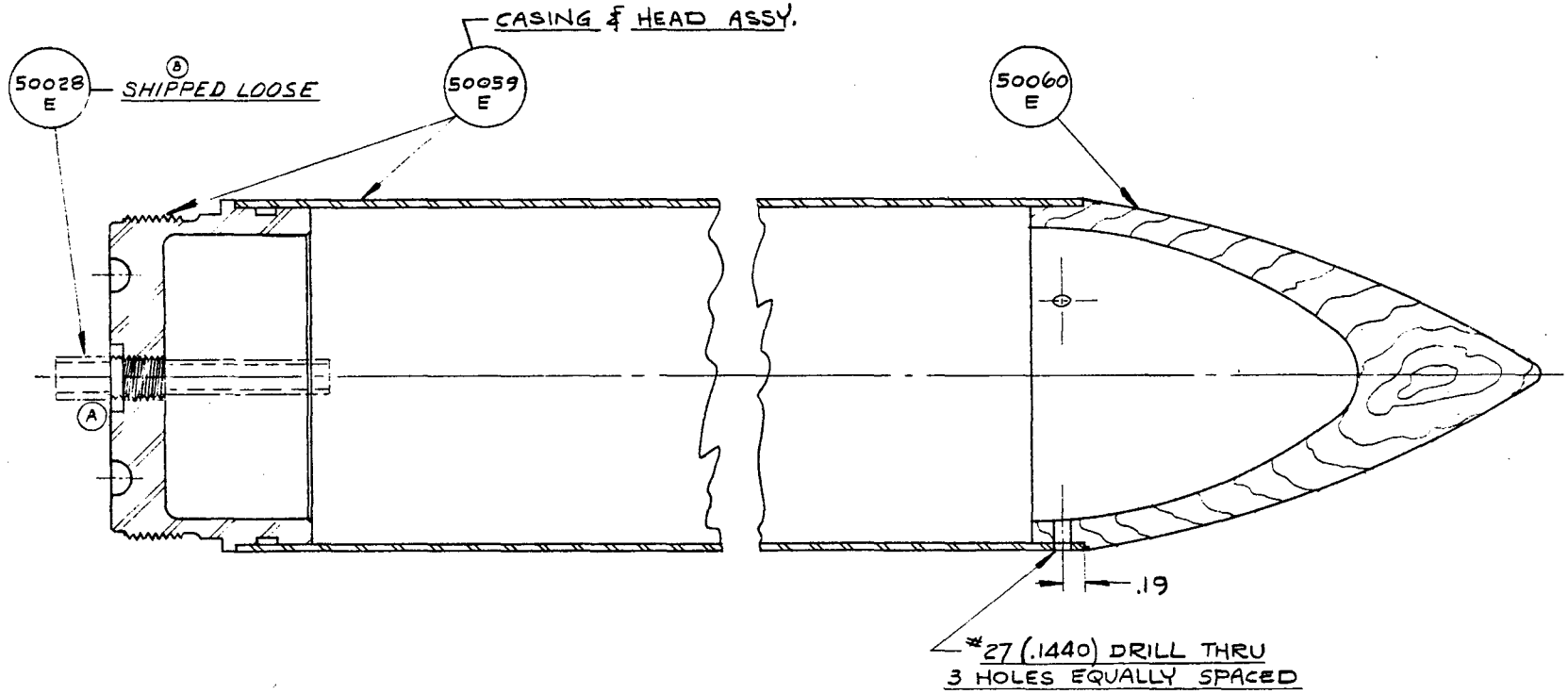
SUP. — BY

BUDD WHEEL CO
DETROIT, MICHIGAN

47226 E

E | 19005-X

MACH DIMS TO HAVE TOL. OF ±.010 UNLESS OTHERWISE SPECIFIED.



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	~	A	HEAD REVISED PER DETAIL	11-22-43

REPORT ERRORS & CHANGES TO ENGINEERING — DO NOT SCALE

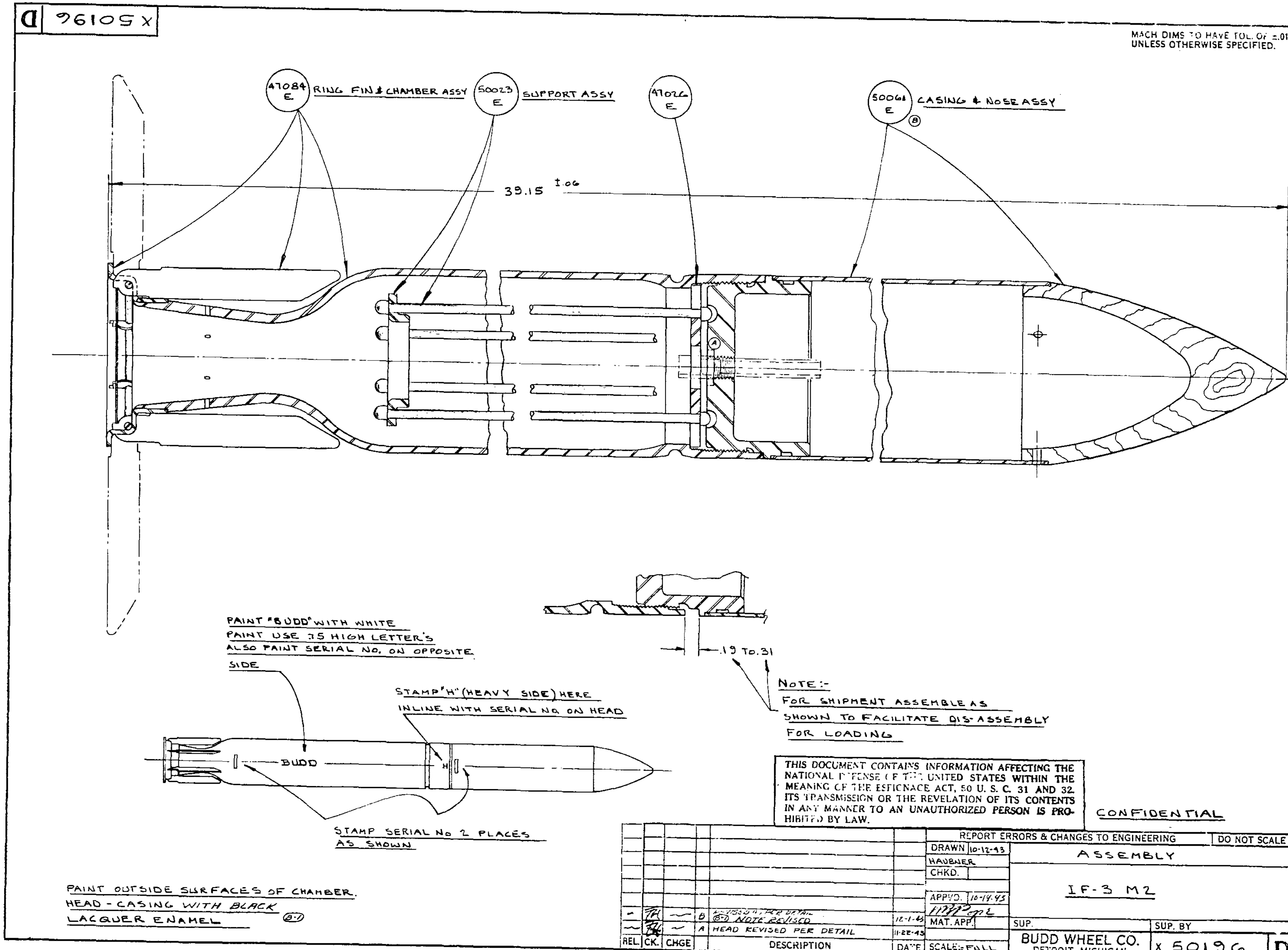
DRAWN 9-22-43 GOEHMANN
CHKD.
APPVD. 9-29-43 M.J. Pope
MAT. APP.
SCALE:- FULL

CASING & NOSE ASSEMBLY

SUP. | SUP. BY

BUDD WHEEL CO. DETROIT, MICHIGAN

X-50061 E


X 50196
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MACH DIMS TO HAVE TOL. OF ±.010
UNLESS OTHERWISE SPECIFIED.
47084 E
RING FIN & CHAMBER ASSY
50023 E
SUPPORT ASSY
47026 E
50061 E
CASING & NOSE ASSY
B
39.15 ±.06
A
PAINT "BUDD" WITH WHITE
PAINT USE .75 HIGH LETTER'S
ALSO PAINT SERIAL NO. ON OPPOSITE
SIDE
STAMP "H" (HEAVY SIDE) HERE
INLINE WITH SERIAL NO. ON HEAD
BUDD
H
STAMP SERIAL No 2 PLACES
AS SHOWN
PAINT OUTSIDE SURFACES OF CHAMBER.
HEAD - CASING WITH BLACK
LACQUER ENAMEL
B-1
.19 TO .31
NOTE:-
FOR SHIPMENT ASSEMBLE AS
SHOWN TO FACILITATE DIS-ASSEMBLY
FOR LOADING
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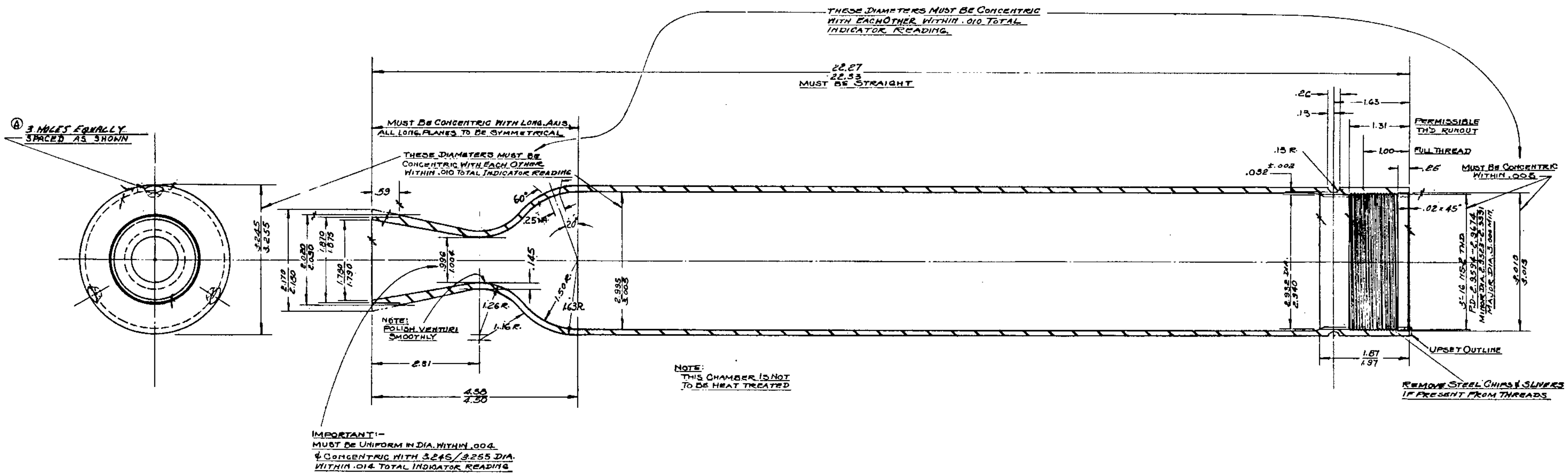
CONFIDENTIAL
REPORT ERRORS & CHANGES TO ENGINEERING
DO NOT SCALE
DRAWN 10-12-43
HAUBNER
CHKD.
APP'D. 10-19-43
MAT. APP.
ASSEMBLY
IF-3 M2
SUP.
SUP. BY
B (B-1) NOTE REVISED 12-1-43
A HEAD REVISED PER DETAIL 11-22-43
REL. CK. CHGE DESCRIPTION DATE
SCALE FULL
BUDD WHEEL CO.
DETROIT, MICHIGAN
X 50196
D

MACH DIMS TO HAVE TOL. OF ±.010 UNLESS OTHERWISE SPECIFIED.



MATERIAL-
SEAMLESS STEEL TUBING
S.A.E. #1035

PAINT ALL INTERIOR SURFACES EXCEPT THREAD & 3.010-3.013 DIA. WITH ONE (1) COAT OF SYNTHETIC LACQUER RESISTING PRIMER (GOV'T. SPEC. # AXS-946) FOLLOWED WITH ONE COAT OF OLIVE DRAB LUSTERLESS LACQUER ENAMEL (GOV'T SPEC. # 3-67E - GRADE - I)

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REL.	CK.	CHGE	DESCRIPTION	DATE
		A	HOLES ADDED	

REPORT ERRORS & CHANGES TO ENGINEERING		DO NOT SCALE
DRAWN 1-28-44 OLEKSY	CHAMBER	
CHKD. 2-17-44 RIDER		
APPVD. 7-22-44		
MAT. APP.	SUP.	SUP. BY
SCALE- FULL	BUDD WHEEL CO. DETROIT, MICHIGAN	X-51076 B

E | X-51086

MACH. DIMS. TO HAVE TOL. OF ±.010 UNLESS OTHERWISE SPECIFIED.

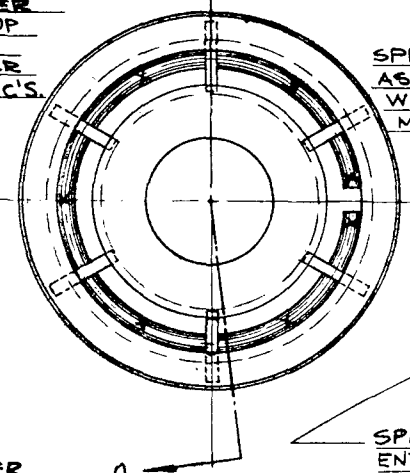
FINS MUST MOVE FREELY FROM VERTICAL TO HORIZONTAL POSITION BY VIRTUE OF THEIR OWN WEIGHT.

INSERT IN PLACE AFTER SPINNING OPERATION. 47074 E

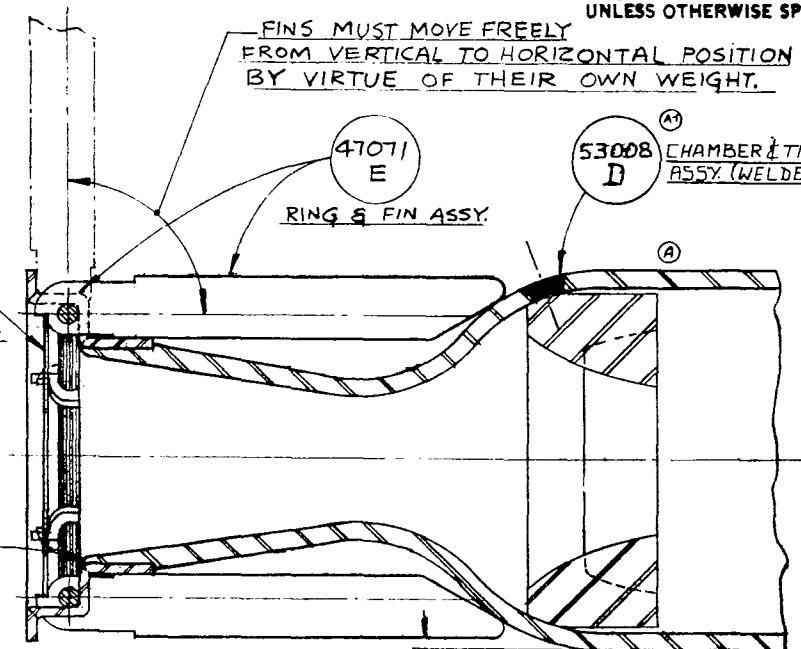
47071 E RING & FIN ASSY.

53008 D (A-1) CHAMBER & TRAP PLATE ASSY. (WELDED)

AFTER SPINNING OPERATION IS COMPLETED, SPUN OVER PORTION OF CHAMBER MUST BE TOUCHED UP WITH OLIVE DRAB LUSTERLESS LACQER ENAMEL GOV'T. SPEC'S. #3-67E GRADE I).



SPINNING MUST PRODUCE ASSEMBLY CAPABLE OF WITHSTANDING 1400# MIN. TENSILE PULL



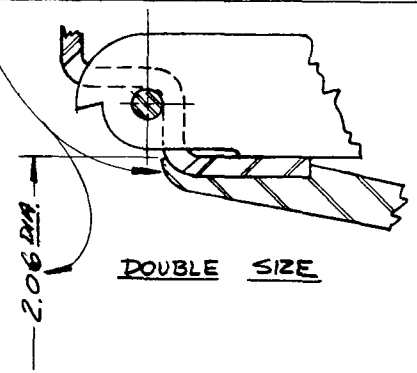
SECTION AA

.02 / .09 OUT SIDE EDGES OF FINS MUST BE HELD WITHIN THESE LIMITS.

SPIN OVER SECURELY AROUND ENTIRE CIRCUMSTANCES.

NOTE: SPINNING OPERATION MUST PRODUCE A TIGHT CONNECTION BETWEEN FIN ASSY. & CHAMBER WITH NO SLIPPAGE BETWEEN PARTS PERMITTED.

SPIN CHAMBER OVER AROUND ENTIRE CIRCUMFERENCE SECURELY. DO NOT EXCEED DIMENSION AS SHOWN.



DOUBLE SIZE

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REL.	CK.	CHGE		DESCRIPTION	DATE
			A	REVISED PER DET'S (A-1) WAS 51085-B	7-20-44

REPORT ERRORS & CHANGES TO ENGINEERING — DO NOT SCALE

DRAWN 1-28-44 Waldinger

CHKD. 2-16-44 RIDER

APPVD. 2-22-44 W F Page

MAT. APP.

SCALE:- FULL

RING-FIN & CHAMBER ASSEMBLY

SUP.

SUP BY

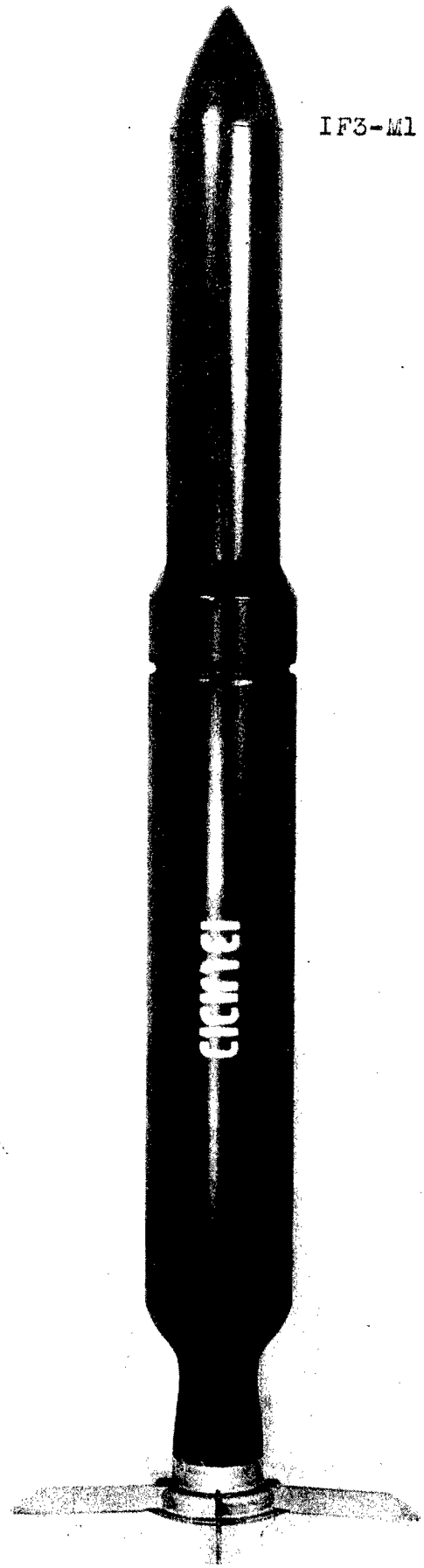
BUDD WHEEL CO. DETROIT, MICHIGAN

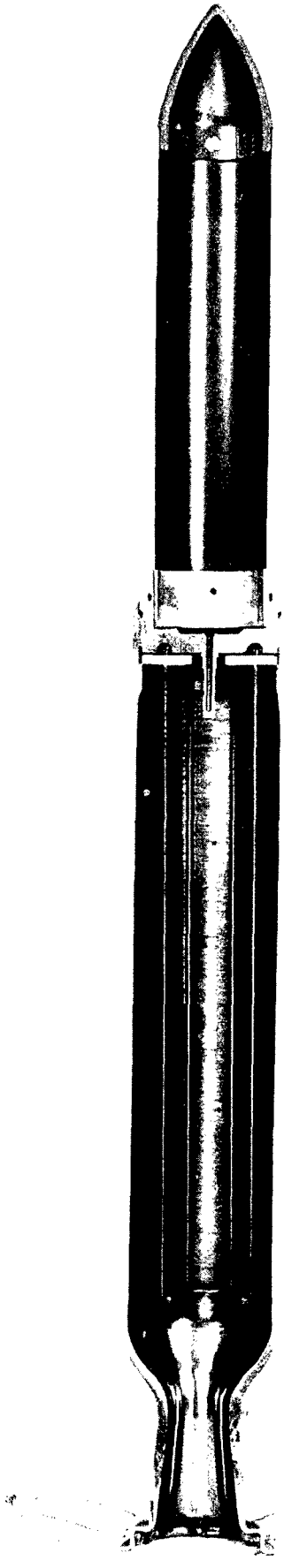
X-51086 E

20

PHOTOGRAPH 1

IF3-M1 Rocket Flare Assembly



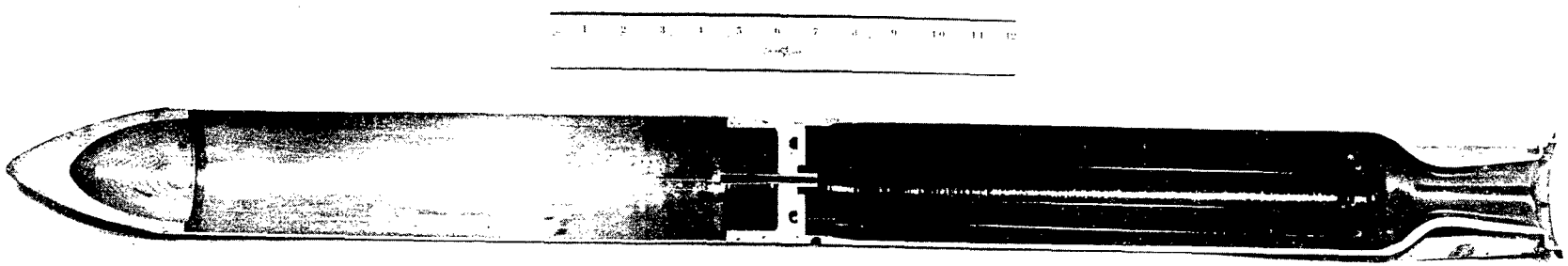


PHOTOGRAPH 2

IF3-M1 Rocket Flare - Half Section

PHOTOGRAPH 3

IF3-M2 Rocket Flare Assembly

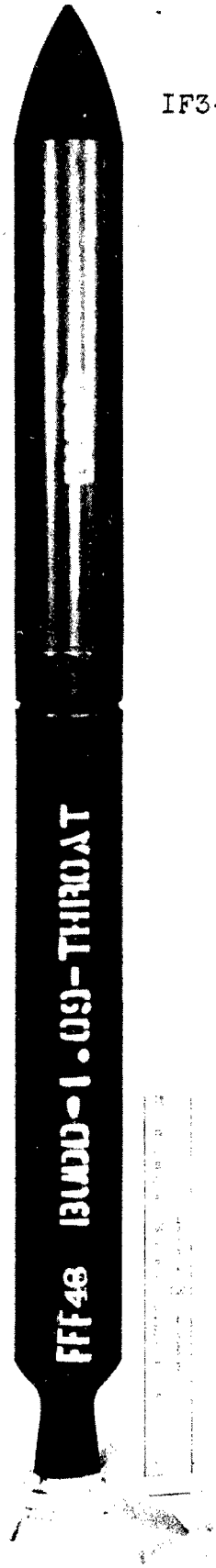


PHOTOGRAPH 4

IF3-M2 Rocket Flare - Half Section

PHOTOGRAPH 5

IF3-M3 Rocket Flare Assembly



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Efforts to Standardize T-5, T-6 and IF3-M1 Rocket Chambers - W. W. Farr - January 20, 21, 1943 - Budd File NE-34.

Final Design Approval IF3-M1 Conference - Dr. C. N. Hickman, Dr. R. E. Gibson and Dr. A. Kossiakoff - January 30, 1943 - Budd File NE-34.

Receipt of Flare Details - Dr. A. Kossiakoff - February 5, 1943 - Budd File NE-34.

Changes in Order to Use Longer Delay Element - Dr. A. Kossiakoff - April 1, 1943 - Budd File NE-34.

Receipt of Instructions of Dr. R. E. Gibson Relative to Reworking of 3½" Flare Rockets made by Central Scientific Company - May 10, 1943 - Budd File NE-43.

Design and Production Required - Dr. R. E. Gibson - May 31, June 7, 1943 - Budd File NE-43.

Instructions Concerning The Production of The IF3-M3 Flare Rocket - Dr. R. E. Gibson - June 23, 1943 - Budd File NE-43.

Modification of IF3-M3 Rocket Production - Dr. A. Kossiakoff and W. W. Farr - July 6, 1943 and September 11, 17, 27, 28, 29, and October 11, 19, 1943 - Budd File NE-43.

Production Release of IF3-M3 Rocket of Budd Wheel Company - February 21, 1944 - W. B. Pope.

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Annapolis, Maryland

TEDDI FORM 60 S (13 MAR 47)

Budd Wheel Co.

AUTHOR(S)

[redacted] 57 C-22-11-73 ATI- 18734

DIVISION: Ordnance and Armament (22) 4

SECTION: Chemicals and Incendiaries (11)

CROSS REFERENCES: Flares (37700)

ORIG. AGENCY NUMBER

O.S.R.D.-6135

REVISION

AMER. TITLE: Rocket flares

over

FORG'N. TITLE:

ORIGINATING AGENCY: O.S.R.D., N.D.R.C., Div. 3, Washington, D. C.

TRANSLATION:

COUNTRY	LANGUAGE	FORG'N.CLASS	U. S.CLASS.	DATE	PAGES	ILLUS.	FEATURES
U.S.	Eng.		Confd'l.	Oct'45	35	19	photos, graphs, drwgs

ABSTRACT

Three rocket flare models known as the IF3-M1, IF3-M2, and IF3-M3 were engineered and manufactured by the Budd Wheel Company. All contained inductively heat-treated rocket motors 3¼ inches in diameter. The heads were of two sizes and contained a black powder charge which at the proper time expelled the Navy parachute flare from the rocket. Drawings are included showing assembly procedure for each of the flare models. Safety groove failure occurred at 6500 psi in hydrostatic tests of the chamber strength, although the body withstood pressures of 12,000 psi. Fire tests results are given in O.S.R.D. 5778.

T-2, HQ., AIR MATERIEL COMMAND AIR TECHNICAL INDEX [redacted] WRIGHT FIELD, OHIO, USAAF

WF-O-21 MAR 47 15M

31

Reclassified per Auth OSRD List # 31
dtd Aug 5-9, 1946 by H R Jordan, USCO
on 9 Aug 49